A new prototype of Epi.q robot family, obstacle climbing UGVs

ATTI

UNIVERSITÀ DEGLI STUDI
DI GENOVA

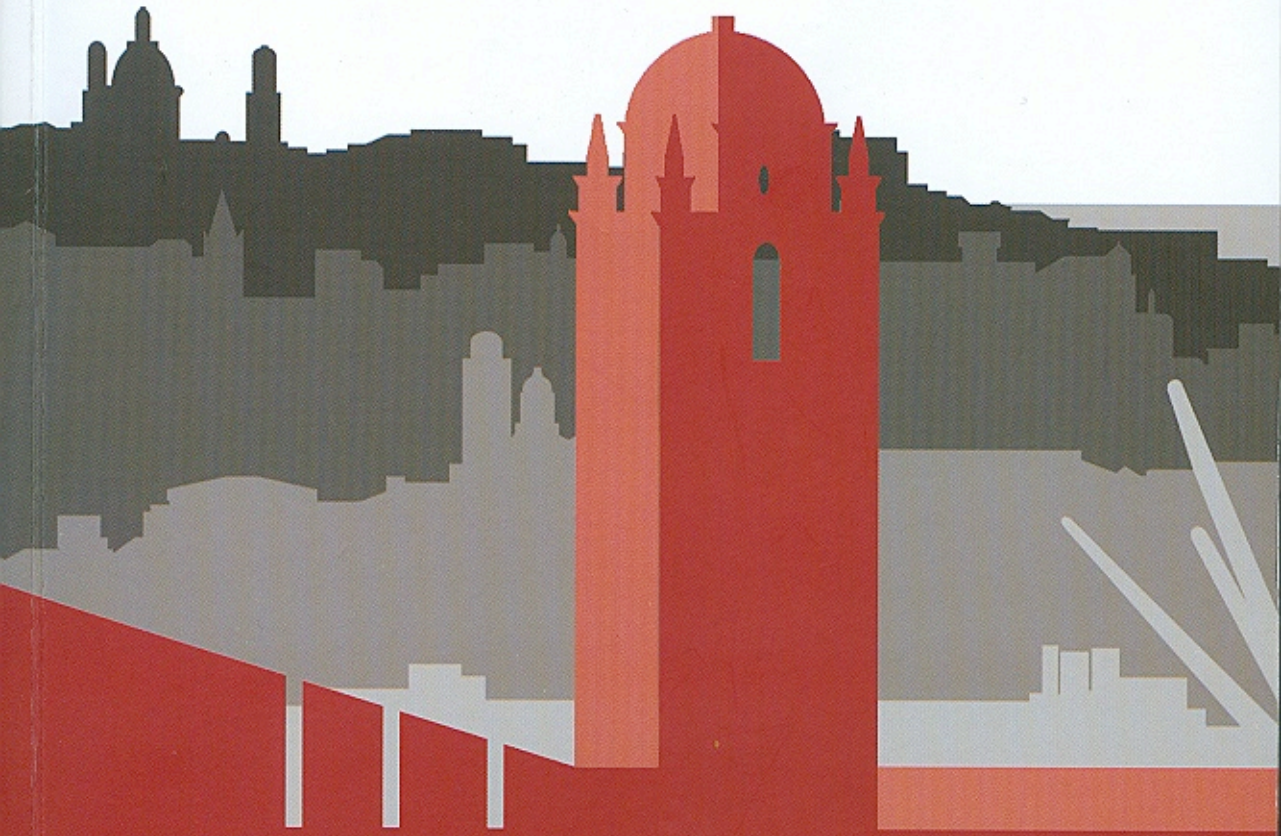
GENOVA UNIVERSITY PRESS

XXII CONGRESSO
ASSOCIAZIONE ITALIANA DI MECCANICA TEORICA E APPLICATA

AIMETA 2015

GENOVA, 14-17 SETTEMBRE 2015

ATTI DEL CONGRESSO



RICERCA

Atti del XXII Congresso dell'Associazione Italiana di Meccanica Teorica e Applicata
Genova, 14-17 Settembre 2015
a cura di Luigi Gambarotta e Angelo Morro

http:// http://aimeta2015.dicca.unige.it/
ISBN 978-88-97752-52-3

GENOVA UNIVERSITY PRESS
È IL MARCHIO DI

UNIVERSITÀ DEGLI STUDI DI GENOVA

EDITO DA DE FERRARI

DE FERRARI

Realizzazione editoriale

Via D'Annunzio, 2/3 - 16121 Genova
Tel. 010 0986820 - 0986821 - 0986822
Fax 010 0986823
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In copertina immagine in primo piano del campanile Seicentesco
della Chiesa di San Silvestro nella Sede di Architettura.
Realizzazione grafica di Massimo Malagugini e Chiara Sparviero.

A new prototype of Epi.q robot family, obstacle climbing UGVs

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Keywords: mobile robot, obstacle climbing, wheel-leg locomotion

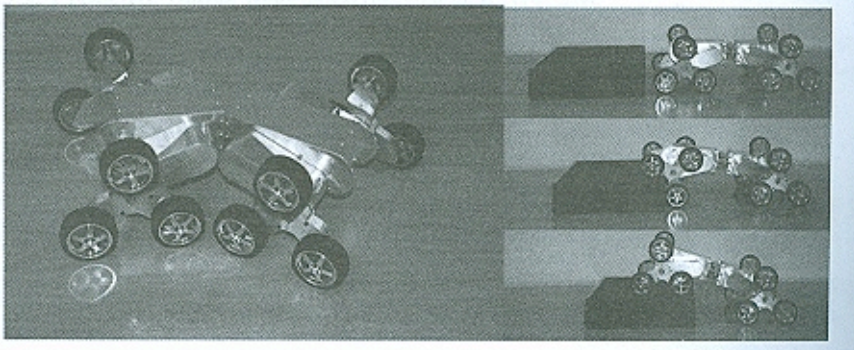
Mobile robots and UGVs are becoming more and more interesting for various application fields such as surveillance and monitoring. The robot ability to avoid getting stuck by unexpected obstacles is a key feature. Different robot architectures can be designed and compared using this feature as evaluation criteria.

The authors, developing the Epi.q robots family, explored the possibility to combine a traditional wheel locomotion system with the use of legs for obstacle climbing. Three prototypes were already built and they proved the effectiveness of the proposed solution. The hybrid wheel-leg locomotion system developed allows to switch without external control from an advancing mode on wheels to a climbing mode using rotating legs when an obstacle, like a step or a stair, is faced. This behaviour is obtained by means of an epicycloidal transmission.

In this work a new prototype of Epi.q UGV family, named Epi.q-Mod2, is presented. Higher performances in terms of speed, acceleration, height of climbing obstacle, max slope addressed the new design, together with the requirement of complete sensing and control solution. A modular approach was followed in order to obtain a structure that can be easily modified. The robot can work with 2 or 4 driving locomotion units, the degrees of freedom between front and rear axles can be changed and coupled with different types of steering logics. Finally, the robot height from ground can be modified and can be adapted to different ground roughness.

Smart features such as the communication with a remote controller for data logging and a not-operated motion are obtained trough a sensing system for measuring motor speed and current and the use of a microcontroller. Moreover the manoeuvrability and controllability are extended thanks to the introduction of a speed and current close loop control. Finally different types of control logics can be selected to test various solutions for managing the robot trajectory with several robot architectures.

In conclusion, the prototype built represents a useful platform and can be used for testing several robot configurations and quantitatively evaluate which one allows the higher robot performances.



Epi.q-Mod2 mobile robot